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The drums of war are beating louder: Media coverage of brown bears in Romania

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Abstract

The increasing demand for resources to meet the needs of our society has transformed the environment and increased the likelihood of human-wildlife interactions. Romania has the highest density of brown bears in Europe, with more than 7000 individuals populating the Carpathian Mountains and neighboring areas. The large brown bear population in Romania inhabits ever-increasing human-dominated landscapes, which frequently results in conflict with humans. The means and frequency by which the media communicates information to the readership influence the public perception of human-wildlife conflicts. This research is intended to contribute to the existing knowledge on human-brown bear coexistence in Romania by (1) exploring how the Romanian media depicts human-brown bear interactions in terms of the main themes discussed, framing of issues (emotions and key messages), and likely impacts on public perception; (2) analyzing the changes in reporting on human brown-bear interactions following the transition of the legal status of the brown bear from game to strictly protected species; and (3) investigating suggested policy and management solutions. The results indicate that news stories related to brown bears became common in Romanian mass media after 2016, when a provisional one-year ban on culling was instated, after which it increased abruptly in 2021, following the whistleblowing of an alleged trophy hunting event. The focus on human-bear interaction and hunting/poaching themes has not changed; however, the position of the media toward brown bears has become increasingly negative, even when presenting news stories covering human-bear interactions that incur no harm. To facilitate human-brown bear coexistence in Romania, scientists and practitioners should communicate with media representatives and provide a supplementary context for news stories. Evidence-informed news can help authorities better understand conflicts and create bottom-up pathways toward an optimistic future for brown bears and Romanian society.

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Keywords
brown bear, human-bear interaction, human-carnivore coexistence, human-wildlife conflicts, media content analysis, *Ursus arctos*

Introduction

The increasing demand for resources to meet the needs of society has transformed the environment, increasing the likelihood of human-wildlife interactions (Treves and Karanth 2003; Nyhus 2016). When wildlife poses a direct and recurring threat to humans, human-wildlife interactions can escalate into conflicts (Treves and Santiago-Avila 2020), which can result in destruction of human property, safety, nuisance, and an increase in wildlife mortality (Lischka et al. 2018). Presently, numerous human-wildlife interaction events have garnered broader visibility due to the ever-widening use of social networks. Furthermore, journalists often exploit social media reports to create certain narratives on traditional media (Zhang and Li 2019); however, the media describes these interaction events by employing sensationalistic headlines and narratives, amplifying the anxiety and perception of the public concerning further threats (Sabatier and Huveneers 2018).

Brown bears (*Ursus arctos*), the largest terrestrial carnivore in Europe, inhabit diverse European regions, including the Scandinavian, Carpathian, Baltic, Balkan, Alps, and Pyrenees regions (Chapron et al. 2014). Owing to their protected status across Europe, brown bears are increasingly abundant (Chapron et al. 2014) and often come in contact with humans (Hartel et al. 2019; Salvatori et al. 2020). Romania hosts the highest brown bear density in Europe, with more than 7000 individuals populating the biodiversity-rich Carpathian Mountains and neighboring areas (Popescu et al. 2016; Ministerul Mediului 2018; Rozylowicz et al. 2019). However, existing data on Romanian brown bears were derived from a mixture of track data, sightings at feeding stations, and expert opinions, without incorporating uncertainties, such as mortality and multiple counts of the same animal (Popescu et al. 2016; Pop et al. 2018; Iosif et al. 2020). The large brown bear population in Romania inhabits ever-increasing human-dominated landscapes, which frequently results in conflicts with humans, such as attacks; livestock depredation; residential break-ins; damage to apiaries, orchards, and crop fields; road/rail accidents; and general nuisances (Pop 2019). The lack of management guidelines to reduce the risk of depredation and bear attacks contribute to conflicting perceptions among stakeholder groups (Popescu et al. 2019; Salvatori et al. 2020).

The mass media plays an important role in addressing environmental conflicts and is currently the primary source of information for the local population (Lester and Hutchins 2013). The means and frequency by which the media communicate information to the readership regarding an event influence public and policy-makers perception of a subject (Dotson et al. 2012; Gandiwa et al. 2014; Hughes et al. 2020; Nanni et al. 2020). Therefore, the media plays an influential role in how the public perceives brown bears, thus, it can promote human-wildlife coexistence or exacerbate future conflicts (Kaczensky et al. 2001; Sakurai et al. 2013).

Despite the increased human-brown bear interactions in Romania, few studies have focused on understanding the depiction of mass media on interaction events. For example, Patru-Stupariu et al. (2022) analyzed media and social media reports of wildlife-human interactions in Prahova Valley and Eastern Carpathians to spatially identify hotspots of landscape disservices (e.g., road kills). This research is intended to contribute to human-brown bear coexistence in Romania by (1) exploring how the Romanian media depicts human-brown bear interactions in terms of the main themes discussed, framing of issues (emotions and key messages), and the likely impacts on public perception; (2) analyzing the changes in reporting on human brown-bear interactions after the transition of the legal status of brown bears from game to strictly protected species; and (3) investigating frequently suggested policy and management solutions.

Understanding how media frames brown bear-related content can support the debate around management solutions (Sabatier and Huveneers 2018). Furthermore, such an analysis may provide appropriate information for scientists, policymakers, and environmental NGOs regarding the necessary steps required to increase the basic knowledge of local people on the ecological importance of brown bears and suggest pathways to mitigate and minimize conflicts (Hartel et al. 2019; Pop 2019).

Methods

This study analyzed articles published between 2007 and 2021 from eight online sources: PRO TV Romania, Agerpres, Mediafax, News.ro, Observator Antena 1, Digi 24, Ziarul Argesul, and Informatia Harghitei. These media selections were based on their degree of influence in Romania (PRO-TV Romania, Agerpres, Mediafax, News.ro, Observator Antena 1, and Digi 24) and areas with high densities of brown bears (Ziarul Argesul and Informatia Harghitei, which are regional media sources). Informatia Harghitei was also selected as it reports on events covered by the media in Hungarian language. The selected media were searched for articles of interest using relevant keywords in Romanian: brown bear, bear, large carnivores, poaching, hunting, and attack.

In 2007, the status of brown bears in Romania transitioned from "game species subject to regulated hunting" to "strictly protected species" under the EU Habitats Directive (Pop 2019); therefore, it was selected as the starting year. Under the provisions of Article 16(1) of the Habitats Directive, the Ministry of Environment can allow the removal of nuisance or aggressive individuals but cannot permit trophy or recreational hunting (Popescu et al. 2021). Because decisions to allow hunting of problematic animals were not based on case-by-case investigations of attacks or damage to human property, in 2016, a one-year hunting ban was enforced to change the management system to a more transparent case-by-case hunting approval process (Popescu et al. 2019). The temporary ban sparked a contentious debate around the status of brown bears in Romania; it was thought that it could potentially lead to an increase in brown bear densities and the likelihood of human-wildlife conflicts (Hartel et al. 2019; Popescu et al. 2019).

After discarding the articles that were not relevant to the investigation of this study (e.g., discussing situations outside Romania and conflicts with other species of large carnivores), 931 media articles related to this study were retained (Table 1).

Table 1. Number of investigated Romanian media articles featuring brown bears.

Media	Coverage and forms	Number of media articles
PRO TV Romania	National / TV station, website	303
Digi 24	National / TV station, website	88
Observator Antena 1	National / TV station, website	48
Agerpres	National / news agency	218
Mediafax	National / news agency	77
News.ro	National / news agency	96
Informatia Harghitei	Local / website	67
Ziarul Argesul	Local / website	34

Following the methodology of Hughes et al. (2020), media articles were grouped into three categories according to the main topic: human-bear interaction (e.g., encounters; attacks on humans, crops, or livestock; property damage; road/rail accidents), brown bear hunting or poaching (e.g., description of poaching or hunting events and discussion on hunting quota), and brown bear biology and ecology (e.g., general information about bears, the need for monitoring, and results of scientific activities). For each article, the following information were extracted: (1) general information (article title, media source, date of publication, and location of the event) that was necessary to determine the distribution of articles by year and county; (2) the secondary topic, which depends on the category in which the article was included (human-brown bear interaction, hunting and poaching of brown bears, and ecology and biology of brown bears); (3) the outcomes of the events as detailed in the articles (only for human-bear interaction articles); (4) the viewpoints on brown bears according to Kellert (1994) typology (utilitarian—bears should be managed to benefit people, this includes hunting; moral—spiritual affiliation with bears and ethical concern; ecological—ecological value, studying of bears and interests in observing bears in their habitats; neutral or negative—indifferent, disinterested, dislike, or fear); and (5) the take-home message concluded in the articles (Hughes et al. 2020). The coding system is described in detail in Suppl. material 1. For each main topic category, explanatory statistics are provided for an overview of the portrayal of brown bears and multiple correspondence analyzes (MCA) of topic categories derived from content analysis (i.e., the association of accountability for creating events, outcomes or proposed solutions, position toward brown bears, and take-home messages for human-brown bear interaction articles; association of position towards brown bears and take-home messages for articles analyzing hunting and poaching and ecology and biology of brown bears). MCA evaluates the associations between a set of more than two categorical variables and can be seen as a generalization of principal component analysis (Rozylowicz et al. 2017; Hjellbrekke 2018). MCA analyzes were performed using the *ca* R package with

default options to calculate inertia (Nenadic and Greenacre 2007; Greenacre 2017; R Core Team 2022). A symmetrically scaled biplot of coordinates of binary coded answers was generated (Greenacre 2017) and included the publication date as a supplementary variable (pre-ban–pre-June 2016 and post-ban–post-June 2016). An answer was considered a significant contributor to an axis if its eigenvalue exceeded the average eigenvalues from the respective axis (Hjellbrekke 2018). The MCA plot of each topic was interpreted while considering that the distances between variables with significant contributions provided a relative measure of their similarity (variables are close to each other) or dissimilarity (variables on opposite sides of the origin of the respective dimension) (Greenacre 2017; Hjellbrekke 2018). Only the first two axes (dimensions 1 and 2) were interpreted; the contribution of the following axis to the principal inertia was insignificant. Supplementary variables were used to interpret the influence of the hunting ban on the portrayal of brown bears in Romanian media.

Results

Of the 931 analyzed mass media articles on brown bears, 77% (i.e., 716) reported interactions between humans and brown bears, 20% (i.e., 186) presented events related to hunting or poaching, and the remaining 3% (i.e., 29) were related to the ecology of this species.

The Romanian media published a few bear-related articles until 2016, when the wildlife administration set a one-year provisional ban on hunting (see Fig. 1). The number of bear-related articles published in 2017 (69 articles) tripled compared to that of 2016 (23 articles). The highest number of bear-related articles was published in 2021 (430 articles;

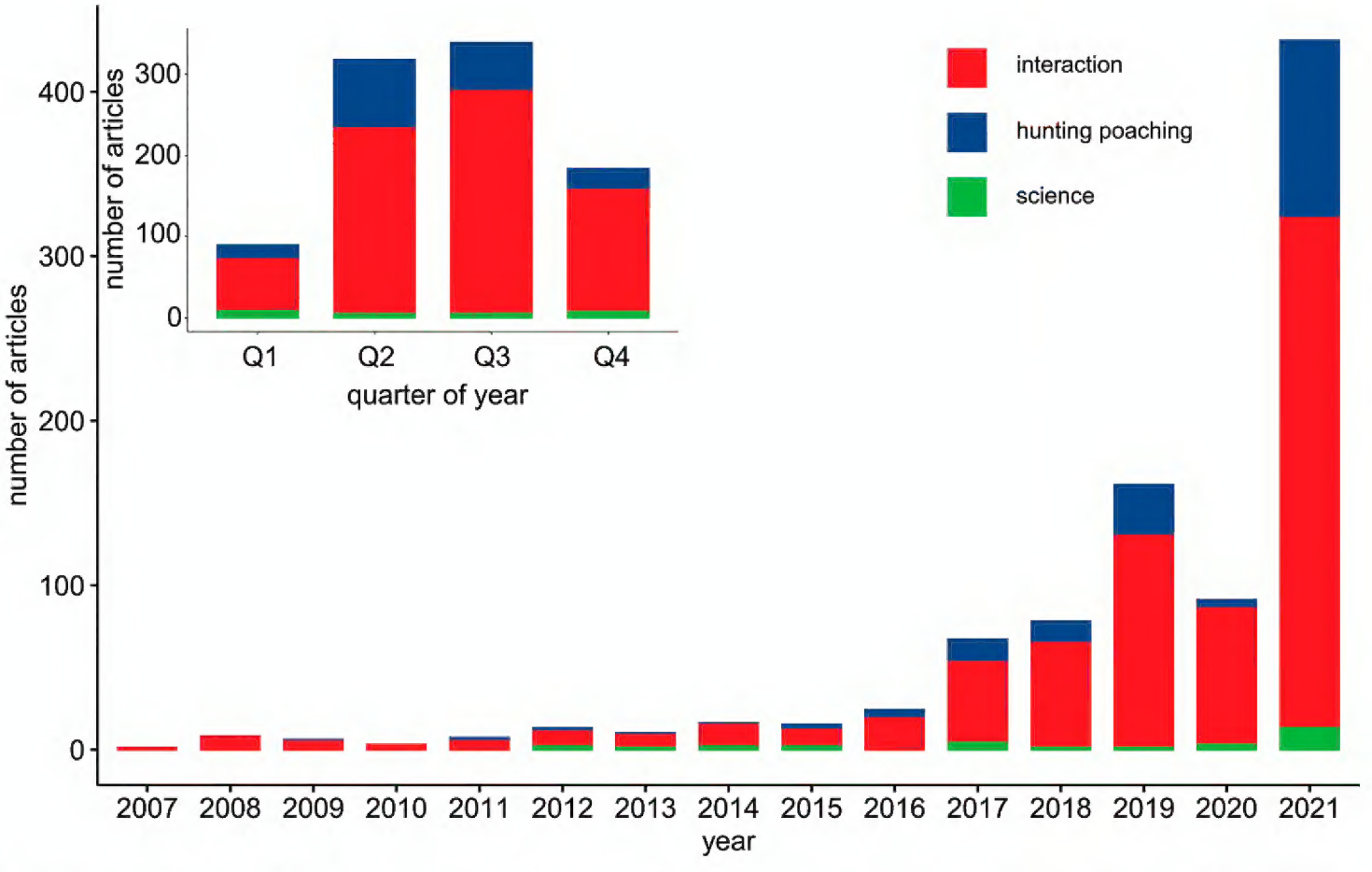

Figure 1. Number of articles on brown bears published between 2007 and 2021 in Romanian media.

46% of the total number of articles in our database). Most of the analyzed articles were published between the months of April and September, a period in which brown bears are most active in Romania (see Fig. 1).

The events that represented the subjects of the analyzed articles occurred in counties located in or near mountainous areas; the media articles presented events in 25 counties. Most of the articles that discussed human-bear interactions occurred in Harghita County (26%; 188 articles), followed by Prahova County (14%; 97 articles) and Arges County (11%; 81 articles). Regarding articles on brown bear hunting and poaching, Covasna County (23%; 43 articles) had the highest number of bear-related articles. The distribution by county can be viewed in Fig. 2. In the third category, concerning the ecology and biology of the brown bear, the topics were debated at the national level, without presenting events from a particular area.

Human-brown bear interactions

The main topic addressed by the Romanian media was the interaction between humans and brown bears (716 articles). The secondary topic reported in this category of the media articles was the spotting of bears near areas with human activity (28%; 204 articles), followed by attacks that resulted in injury to a person (16%; 116 articles) and property damage to gardens, beehives, barns, and livestock (20%; 145 articles). The less frequently reported topics included encounters with brown bears without casualties (15%; 106 articles), injury/death of bears following a car/train accident (6%; 46 articles), and attacks that resulted in the death of a person (4%; 27 articles; Suppl. material 1: Table S1).

Media articles on human-brown bear interactions presented several policy and management solutions to mitigate conflicts. The most suggested solution was to deter bears by pursuing them with dogs, cars, rubber bullets, or noise (16%; 117 articles). Other frequently suggested solutions were to relocate problematic bears to other areas (8%; 60 articles); request a hunting permit (5%; 39 articles); capture and release injured bears back into the wild or move them to zoos or rehabilitation centers (5%; 34 articles); and fine tourists and locals who feed bears (3%; 20 articles; Suppl. material 1: Table S2).

Most articles did not suggest a causal effect for the events (68%; 489 articles); however, 18% of the articles (131 articles) considered humans responsible for the interaction events, whereas in 12% (84 articles) of the articles, brown bears were considered the main cause of conflict (Suppl. material 1: Table S3).

The attitude towards brown bears, perceived from reading the articles, was predominantly negative (53%; 380 articles). In these articles, the authors used phrases such as: "*At any moment the people can find themselves in front of a hungry bear*;" "*Beyond the horror they live with every day, they have lost their patience and trust in the authorities*;" and "*People are afraid of the worst*." A neutral position was supported in 264 (37%) articles, and the remaining 10% of the articles had either moral (64 articles), ecological (four articles), or utilitarian (four articles) opinions about brown bears (Suppl. material 1: Table S4). The main take-home messages of the media articles about human-bear interactions are outlined in Table 2.

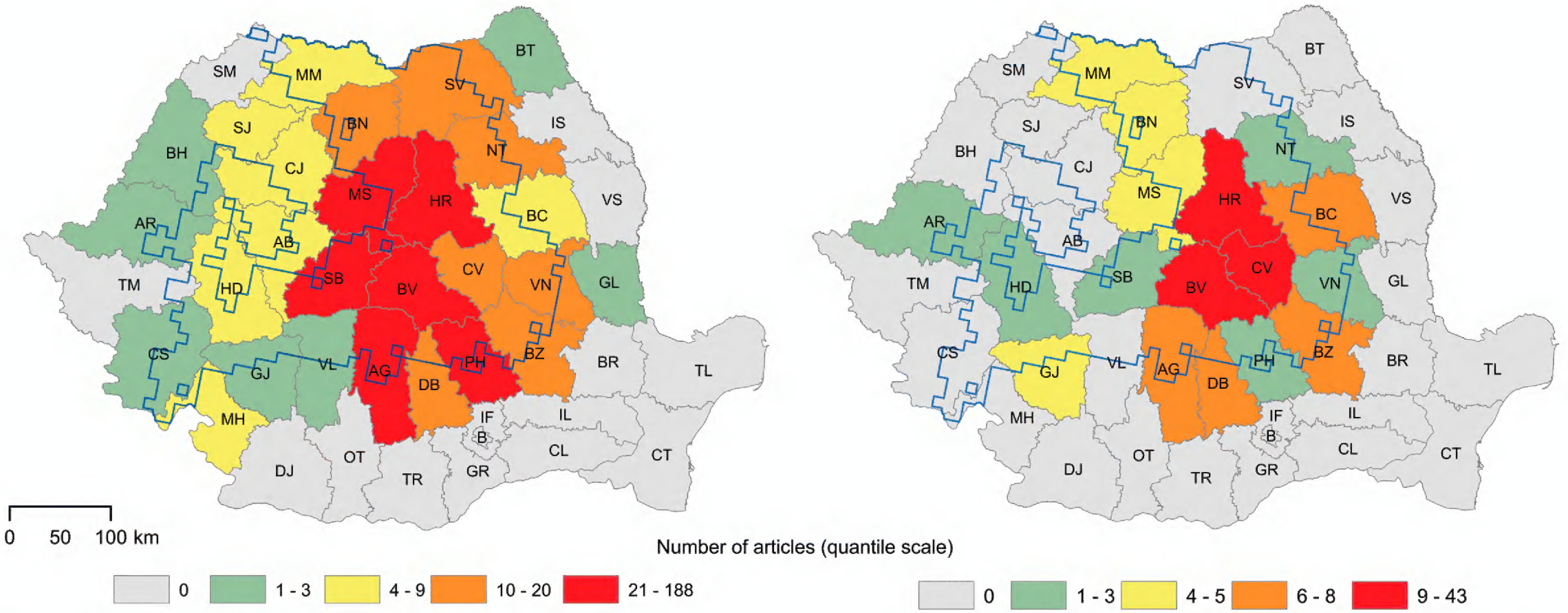

Figure 2. County-level spatial distribution of articles about brown bears published between 2007 and 2021 in Romanian media (**a** articles about human-brown bear interaction **b** articles about brown bear hunting/poaching; blue – area permanently inhabited by brown bears). Articles covering the ecology and biology of the brown bear and those with nationwide coverage were not represented (31 articles on human-brown bear interaction, 62 articles on brown bear hunting and poaching, and 28 articles on the ecology and biology of brown bear).

Table 2. The take-home messages of media articles discussing human-bear interaction.

Take-home message	Number of articles	%
There is an urgency due to the increasing number of bears, habitat degradation, and conflict with people	270	38
Brown bears are a public safety threat	196	27
No message suggested (objective news)	126	17
No or minor issues with bears or their habitats (sighting of bears or non-conflictual encounters are normal)	27	4
Local people/tourists are responsible for conflicts with bears	44	6
Monitoring is needed to inform management decisions (e.g., when to hunt, how many bears should be hunted, when to feed bears in the forest)	51	7
More scientific research is necessary to understand conflicts (e.g., why the interaction occurred, why the bear was aggressive)	2	1

Bear hunting and poaching

This study identified 186 articles on the hunting and poaching of brown bears in Romania; the number of articles on this topic only increased in 2019 (17%; 31 articles). A significantly higher increase was recorded in 2021 (58%; 108 articles; see Fig. 1). The most presented secondary topic was the discussion of poaching issues (55%; 102 articles), followed by the proposals for the hunting of brown bears and preventive quotas (33%; 62 articles) and issuing of permits for hunting of aggressive bears (10%; 18 articles; Suppl. material 1: Table S5).

The main position resulting from articles debating hunting or poaching of brown bears in Romania was moral (46%; 86 articles), for example, when discussing poaching events. However, when discussing the need to hunt for an aggressive bear, the perception towards bears was negative (18%; 33 articles). In 63 articles (34%), the approach was neutral (Suppl. material 1: Table S6). The main take-home messages of the articles related to hunting or poaching are presented in Table 3.

Table 3. The take-home messages from the media articles discussing bear hunting/poaching.

Take home message	Number of articles	%
Poaching is an act of cruelty, endangering both bears and people	61	33
There is an urgency due to the increasing number of bears, habitat degradation, and conflict with people	37	20
No message suggested (objective news)	29	16
Monitoring is needed to inform management decisions (e.g., when to hunt, how many bears should be hunted)	22	12
Brown bears are a public safety threat	17	9
Other messages (e.g., hunting is a sport, hunting is necessary to maintain wildlife, hunting is an act of cruelty)	10	5
More scientific research is necessary to understand conflicts (e.g., why interaction occurred, why the bear was aggressive, why poaching occurred)	10	5

Ecology and biology of the brown bear

During the analyzed period, the ecology and biology of brown bears were rarely a media subject (n = 29). However, there was an increase in 2021, when 13 articles were published. The main issue addressed was related to the brown bear population in Romania (38%; 11 articles), followed by the fragmentation of brown bear habitats and its subsequent consequences (21%; six articles) and the need for improved research (21%; six articles). Three articles discussed other threats, such as climate change (Suppl. material 1: Table S7). The main position towards bears was ecological (62%; 18 articles), followed by neutral (24%; seven articles). Negative (two articles) and moral (two articles) point of views were also reported (Suppl. material 1: Table S8). The main take-home messages on the ecology and biology of brown bear media articles are listed in Table 4.

Table 4. The take-home messages from the media articles discussing the ecology/biology of brown bears.

Take home message	Number of articles	%
Monitoring is needed to inform management decisions	10	35
More research is necessary for solving the problems	6	21
There is an emergency due to the increasing number of bears, habitat degradation, and conflict with people	4	14
Other messages (e.g., information on movement ecology, information about a bear sanctuary, what to do in a forest)	3	10
No message suggested (objective news)	3	10
Local people/tourists are responsible for conflicts with bears	3	10

Multiple correspondence analysis (MCA) of media articles

The MCA between the secondary theme of the media articles discussing human-bear interactions, main position towards bears, description of the individual responsible for the outcome of the interaction, solution to the presented issue, and take-home message explained 62.5% of the variance (Fig. 3).

The analysis indicated that the articles that were published before and after the 2016 hunting ban had a similar approach to describing the events generating the respective news. Dimension 1 of the MCA confirmed that the articles that negatively depicted bears were mostly perceived as such by people who considered this species a threat to humans or their property. The opposing viewpoint includes articles with a moral position towards human-bear interaction events. From the perspective of these articles, humans are responsible for creating these events, and the solution for reducing the number of interaction events is to impose fines on people for feeding bears either directly or indirectly (by generating exposed waste). Furthermore, the take-

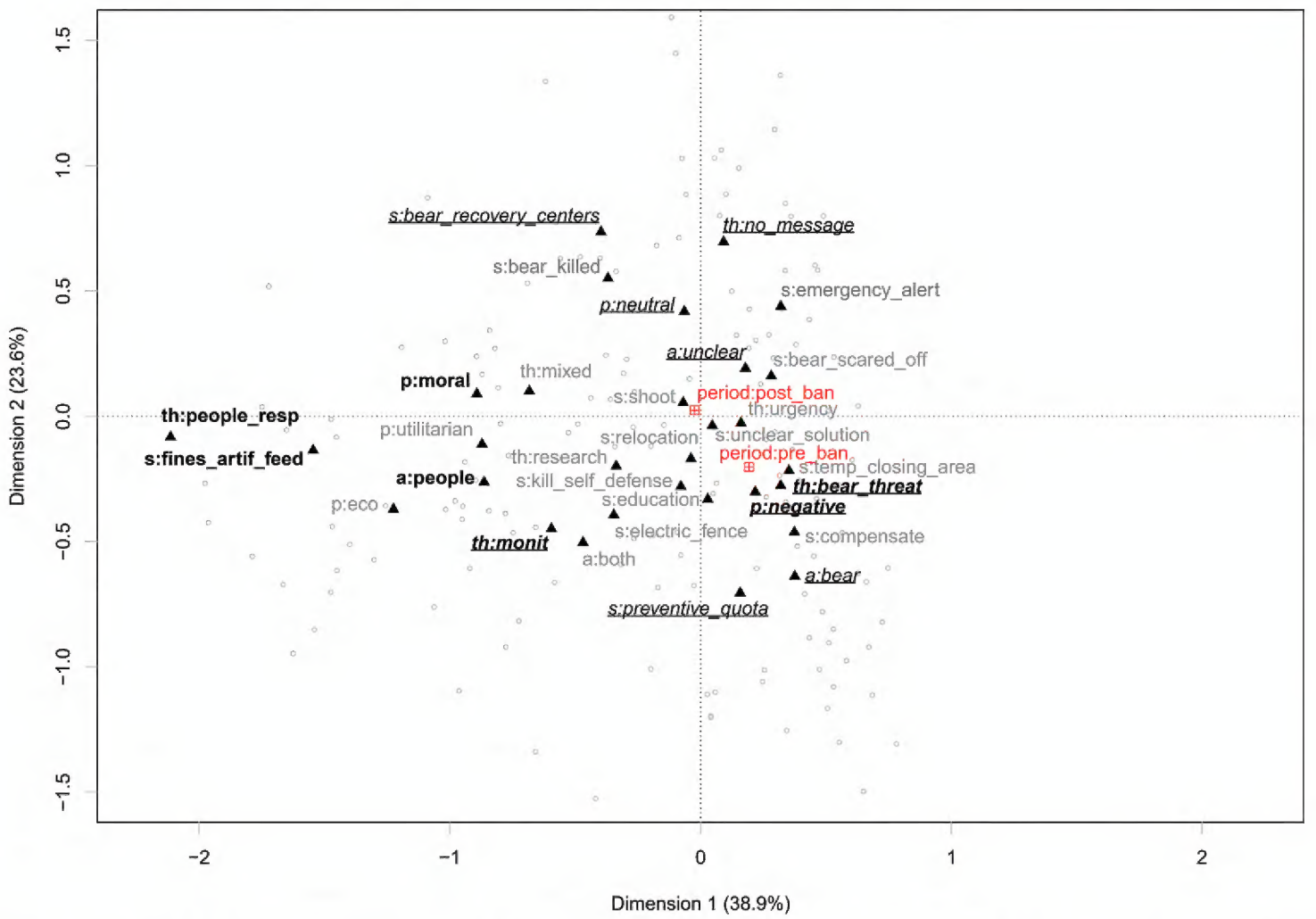

Figure 3. Multiple correspondence analysis (MCA) plot showing the clustering of human–brown bear interaction articles. Categories in bold contribute significantly to Dimension 1. Categories underlined and in italics contribute significantly to Dimension 2. s = solution, a = accountability for creating the interaction event, th = take-home message, p = media position toward brown bears. Supplementary variables are shown in red.

home message from this group of articles was that humans exacerbate human-bear conflicts. Dimension 2 of the MCA indicated that articles that presented a negative position towards bears considered bears as the sole cause of conflicts, with preventive hunting being a solution to reduce the number of interactions. This group of articles concluded that bears threaten humans and their properties. A second group, with a significant contribution to Dimension 2, comprised articles with a take-home message of the requirement for a better brown bear monitoring program. Opposed to these articles were those with a neutral position towards the presented issue. Typically, such articles did not indicate a clear responsibility or abstain from presenting take-home messages, and occasionally suggested that sending aggressive bears to recovery centers is a viable option.

When analyzing articles with hunting or poaching as the main theme, MCA explained 91% of the data variance (Fig. 4). Dimension 1 shows that the articles presenting a moral position towards bears presented the consequences of poaching to humans and/or bears as take-home messages. These articles were opposed to those with a negative or neutral position towards bears. Dimension 2 shows that the media articles that were in a neutral position had no take-home messages.

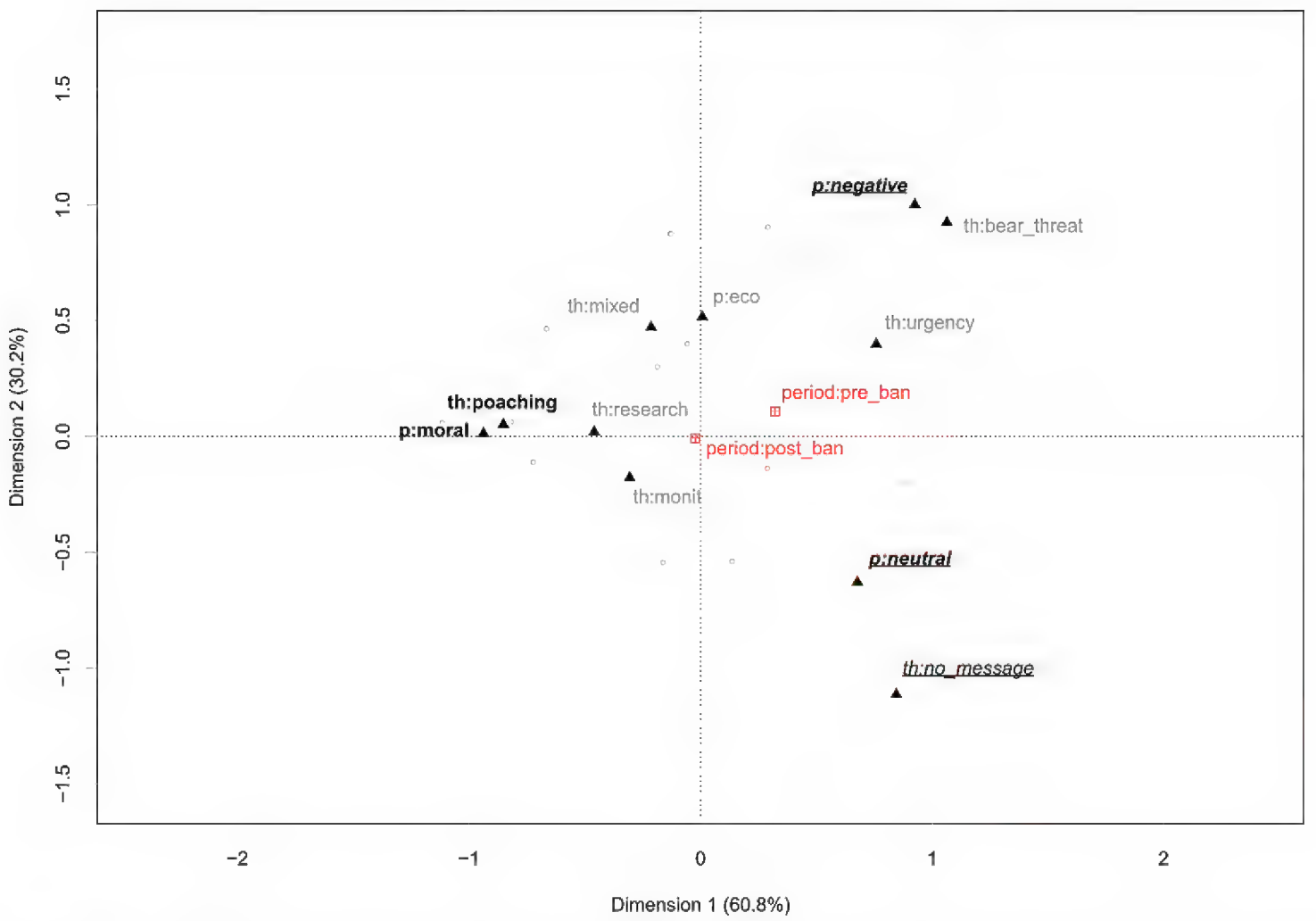

Figure 4. Multiple correspondence analysis (MCA) plot showing the clustering of bear hunting and poaching articles. Categories in bold contribute significantly to Dimension 1. Categories underlined and in italics contribute significantly to Dimension 2. a = accountability for creating the event, th = take-home message, p = media position toward brown bears. Supplementary variables are shown in red.

The MCA for the science-related mass media articles explained 93% of the variance (Fig. 5). Dimension 1 of the MCA indicates that the media articles in a negative position had mixed take-home messages. In contrast, Dimension 2 shows that the science-related mass media articles presenting a moral position toward bears indicated the urgency for proper management as a take-home message. Such articles are opposed to those with neutral positions and no take-home message.

Discussion

News stories related to brown bears became common in Romanian mass media after 2016, following the instatement of a provisional one-year ban on culling (Popescu et al. 2019). It later increased abruptly in 2021 following the whistleblowing of an alleged trophy hunting event (Popescu et al. 2021) and the recovery of the tourism industry after the 2020 COVID-19 travel restrictions (Plzáková and Smeral 2022). The focus on human-bear interactions and hunting/poaching themes has not changed; however, media perception towards brown bears has become increasingly negative, even when presenting news stories covering human-bear interactions that incur no harm.

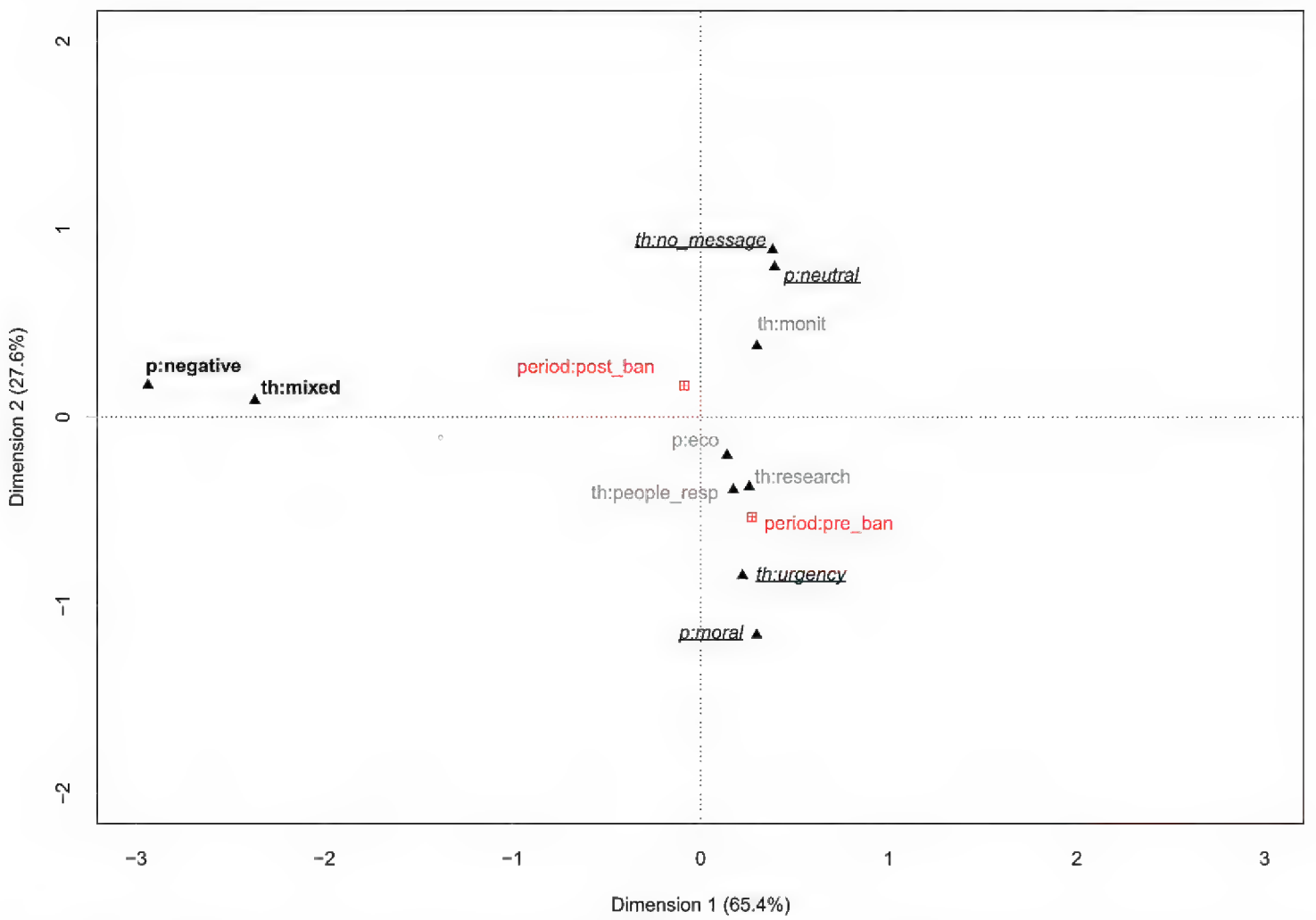

Figure 5. Multiple correspondence analysis (MCA) plot showing the clustering of biology and ecology of brown bear articles. Categories in bold contribute significantly to Dimension 1. Categories underlined and in italics contribute significantly to Dimension 2. Th = take-home message, p = media position toward brown bears. Supplementary variables are shown in red.

Because Romanian mass media is increasingly interested in reporting interactions between humans and bears, media content analysis can be used as a tool for understanding the types of conflict and complementary mapping of human-bear conflict hotspots (Nyhus 2016; Patru-Stupariu et al. 2022). For example, this analysis indicated that most cases are reported in areas where high brown bear density overlaps with extensive farming (e.g., Harghita and Mures counties) and tourist attractions (e.g., renowned resorts and scenic trails, such as the Prahova Valley and Transfagarasan mountain road); these two sources of conflicts require different management strategies (Fortin et al. 2016; Penteriani et al. 2016; Manea et al. 2018; Hartel et al. 2019; Morales-González et al. 2020; Patru-Stupariu et al. 2020).

The increasing number of articles is not a true reflection of the actual increase in human-bear interactions. Other factors, such as the exponential use of social media by people and campaigns of hunting associations and local authorities for a lethal management system, may have contributed to this surge. For example, Darimont et al. (2018) considered the inflated population sizes of brown bears by Romanian authorities (Popescu et al. 2016) as a case of "political population," i.e., populations with ecological attributes that were constructed to serve political interests.

Most of the analyzed articles in the human-bear interaction category did not describe actual conflicts but only the presence of bears where people pursue their activities or experience an encounter with no harm (e.g., 43% of the articles reported on the sighting of bears near inhabited areas and encounters with no casualties); moreover, when the interaction involves a bear attack, the event is extensively broadcasted, although the outcome is not fatal. Similar results have been reported in other countries, such as the case with grizzly bears in Canada (Hughes et al. 2020), brown bears in Slovenia (Kaczensky et al. 2001), and Asian black bears in Japan (Sakurai et al. 2013). Multiple reports of such events are legitimate; however, in numerous instances, there is a lack of background information on the circumstances of bear attacks, which hinders the role of the media in mitigating similar types of conflicts in the future (Bombieri et al. 2018; Stafford et al. 2018). Furthermore, reporting on the simple presence of bears as a potential conflict can heighten fear and undermine efforts to protect the species (Nanni et al. 2020).

The public perception of bears can influence top-level wildlife management decisions (Hughes et al. 2020; Nanni et al. 2020). With the support of mass media, people can pressure wildlife authorities into implementing improvised management measures that may not suit the dual goal of the conservation of brown bears and safety of humans and their property (Fernández-Gil et al. 2016). For example, the mass media in Romania frequently puts forward management solutions, such as the hunting of brown bears, to reduce their population sizes (i.e., prevention quota), or hunting of any bear that enters a settlement or damages personal property (i.e., intervention quota). However, in the absence of other mitigation measures, such as bear-friendly waste management systems, the extensive use of electric fences and guard dogs, and enforcement of a code of conduct for tourists, lethal methods may only marginally reduce the number of conflicts and likely degrade the conservation status of predators (Treves et al. 2016; Popescu et al. 2019; Treves et al. 2019). Alarmist reporting on human-bear interactions, the lack of context, and limited information on legal mitigation measures that can be deployed can also persuade local people to use extreme and illegal measures, including poaching (Pop 2019; Popescu et al. 2019; Nanni et al. 2020).

Romanian media repeatedly reports that deterring bears away from settlements by chasing them with cars, noise, or dogs is a viable solution to conflicts. Such measures are, at best, short-term solutions that do not guarantee that bears will not cause damage in future (Morales-González et al. 2020). This highlights that the media is not always aware of the dangers of the proposed options and that wildlife authorities, including researchers, are not actively discouraging them. Another commonly presented option is the relocation of bears to another area within Romania; the Romanian management system favors the latter management option (Ministerul Mediului 2018); however, it can lead to conflicts between locals and officials due to the "*moving the problem to another area*" approach without adequately addressing the issue, as already highlighted by the media. An alternative, which is often demanded by people, is the relocation of bears to other European Union countries. This approach is not realistic, as there are no

requests from other countries, and it will likely create an image of undesirable species. The management options reported by Romanian media differ from those in other case studies. For example, Hughes et al. (2020) showed that in Canada, the commonly discussed solutions to reduce human-grizzly bear conflicts are the installation of warning panels and electric fences and better rules on the cleaning of recreational areas, which are more effective than lethal management strategies (Littlewood et al. 2020).

Many Romanian media reports indicate that humans are often responsible for the conflict. Inappropriate behaviors of people, such as getting closer to bears to take photos, feeding bears, littering in picnic areas, chasing bears, and leaving livestock unguarded, can have serious consequences for their safety, and bears often end up being labeled as aggressive (Bombieri et al. 2018; Nanni et al. 2020). Less frequently, local authorities are also considered responsible, often lacking measures to mitigate these conflicts, such as lobbying national authorities for hunting permits or applying non-lethal preventive measures. In some cases, unmitigated conflicts had led to the poaching of bears with no legal consequences for hunters (Carter et al. 2016).

Although the overarching role of the media is to share information impartially and objectively (Sambrook 2012; Gavrilidis et al. 2022), in most cases, wildlife is most often depicted negatively, favoring an anthropocentric view of conservation (Fernández-Gil et al. 2016; Dayer et al. 2017). This was also valid for this case study, with fewer than 37% of articles on human-bear interaction maintaining a neutral position toward the parties involved in the conflicts. More than 53% of the analyzed articles presented a negative perception towards bears, such as fear-mongering, resentment, and revolt, which promoted a negative image of bears to its readership (Kaczensky et al. 2001; Fernández-Gil et al. 2016; Hughes et al. 2020). Local media (e.g., Informatia Harghitei and Ziarul Argesul) overwhelmingly report negatively on bear interactions, which is most likely due to the fact that the authors are residents of the affected areas and, thus, part of the conflict. The findings of this study correlate with the conclusions drawn by Kaczensky et al. (2001) in Slovenia, where the local media also focused on reporting human-bear conflicts and expressing a negative perception towards bears.

The most frequent take-home messages in Romanian media articles concerning brown bears were related to the increasing number of human-bear conflicts and high density of brown bears. Habitat fragmentation, an important source of conflict (Pop 2019), is rarely and ambiguously detailed. As Hughes et al. (2020) demonstrated, mass media can easily undermine non-lethal management measures by focusing on alarming messages without other rationales. For example, the media in Romania often uses phrases such as "*They can wake up in front of a hungry bear at any time*" or "*Locals are afraid of the worst*" without offering evidence or advice and leaving no alternatives other than anthropocentric management options.

Authorities and scientists can better understand illegal hunting practices by analyzing articles in the media. For example, in Romania, poaching is often an attempt by local people to protect their property from damage. In many cases, the target species is not the brown bear, which highlights that wildlife management requires a multi-species approach. Compared to other studies (Sakurai et al. 2013; Hughes et al. 2020), the share

of articles related to poaching in the total number of articles related to hunting is higher in Romania, suggesting that poaching control is ineffective (Pop 2019). The increasing number of poaching articles in 2021 was due to an event that occurred in March 2021 when a bear of considerable size, known as Arthur (Agent Green 2021), was shot and killed in an allegedly illegal trophy hunt in Covasna County (Popescu et al. 2021). The event was widely covered in the Romanian and international media and forced environmental authorities to close a legal loophole and specifically forbid the trophy hunting of brown bears in Romania (Ministerul Mediului, Apelor si Padurilor 2022).

This study indicated a clear link between the topic of poaching and the moral position towards brown bears. Most articles on the poaching of brown bears were presented with a moral position, with the practice being labeled as unacceptable cruelty. Furthermore, 43% of the articles discussed brown bear hunting or poaching calls for management by lethal methods, such as preventive hunting (population control) or intervention quotas (hunting of aggressive brown bears). Even in those cases where the illegal hunting by landowners is a result of habitat fragmentation or expansion of economic activities (e.g., logging and grazing), the suggested management option by media was the lethal removal of brown bears because of overpopulation. However, Romania does not have a research-grade census of the brown bear population, indicating that overpopulation is still an assumption (Popescu et al. 2016; Ministerul Mediului 2018; Pop et al. 2018; Popescu et al. 2021). To avoid management mistakes, there is a need for further studies on human-brown bear interactions to fully understand the viability of increasing hunting quotas, such as obtaining a more reliable census of the brown bear population and identification of overpopulated areas.

The low number of articles on the ecology and biology of brown bears implies that there is less consideration of the ecological significance and impact of human activities on its conservation status. The few articles on this topic were mainly related to the high density of bears in Romania and the absence of a reliable census. Other subjects, such as the management methods; role of brown bears in ecosystems; cultural role of the brown bear; and threats, such as habitat fragmentation, overexploitation of bear food resources, and climate change, are often neglected. This is also valid for other case studies (Fernández-Gil et al. 2016; Nanni et al. 2020), indicating that scientists are reluctant to disseminate their research (Hartel et al. 2019) or that the media may not be interested in publishing the results of such research.

For mainstream human-bear coexistence (Hartel et al. 2019; Papp et al. 2022), scientists and practitioners should communicate with media representatives and provide additional context for news stories. For example, wildlife experts can formulate their own news stories on events where human-wildlife conflicts can be used to teach to people precautionary measures on avoiding harmful interactions and succinctly explain the context of bear attacks. In addition, the media can improve the reporting of human-wildlife interactions by actively asking wildlife experts to comment on events. Evidence-informed news can also help authorities better understand conflicts and create bottom-up pathways towards an optimistic future for brown bears and the Romanian society.

Conclusions

Romanian media is increasingly interested in reporting on brown bears; however, most articles describe human-bear interactions, while other topics, such as hunting/poaching and the ecology of brown bears, are neglected. The 2016 provisional ban on hunting created debates over the management of brown bears in Romania; however, the topics of articles remained focused on human-bear interaction events, most of them without reporting actual conflicts but only the presence of bears. Another key event that triggered many media reports and, subsequently, public attention was the killing of Arthur (one of the largest brown bears observed in Romania) in a trophy hunt (Agent Green 2021). This event generated public reactions similar to the killing of a high-profile African lion, known as Cecil (Nelson et al. 2016), and forced environmental authorities to forbid trophy hunting of brown bears in Romania.

Increasing the frequency of reporting non-harmful human-bear interaction events with alarm messages can only lower the level of acceptability and influence political decisions regarding the management of the brown bear population (Hughes et al. 2020; Nanni et al. 2020). A low level of tolerance in Romania is also noticeable from the increasing number of poaching episodes reported in recent years.

Publishing detailed and evidence-informed news can provide valuable information on avoiding conflict and facilitating the implementation of effective conservation and management strategies.

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Supplementary material 1

Appendix S1. Coding categories (adapted from Hughes et al. 2020) and descriptive statistics of analyzed media articles

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Data type: MS Word file

Explanation note: **Table S1.** Secondary topics of articles on human-bear interaction. **Table S2.** Outcomes/proposed solution from human-bear interaction articles. **Table S3.** Responsible for interaction event as discussed in human-bear interaction articles. **Table S4.** Attitude towards bears as resulted from reading human-bear interaction articles. **Table S5.** Secondary topics of hunting/poaching articles. **Table S6.** Attitude towards bears as resulted from reading hunting/poaching articles. **Table S7.** Secondary topics of science-related articles. **Table S8.** Attitude towards bears as resulted from reading science-related articles. **Table S9.** Take-home messages suggested by human-bear interaction articles. **Table S10.** Take-home messages suggested by hunting/poaching articles. **Table S11.** Take-home messages suggested by science-related articles.

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